Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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May 18, 2016

Mr. Miguel Rodriguez, LNG Manager
Eversource
157 Cordaville Road
Southborough MA , 01772

RE: **Hopkinton**
Transmittal No.: X268846
Application No.: CE-16-004
Class: *OP*
FMF No.: 130904
AIR QUALITY PLAN APPROVAL

Dear Mr. Rodriguez:

The Massachusetts Department of Environmental Protection ("MassDEP"), Bureau of Air and Waste, has reviewed your Non-major Comprehensive Plan Application ("Application") listed above. This Application concerns the proposed substantial reconstruction, including burner replacement, of the four natural gas vaporizers units at your liquefied natural gas ("LNG") storage facility located at 52 Wilson Street in Hopkinton, Massachusetts ("Facility"). The Application bears the seal and signature of Alicia R. Kabir, Massachusetts Registered Professional Engineer Number 46671.

This Application was submitted in accordance with 310 CMR 7.02 Plan Approval and Emission Limitations as contained in 310 CMR 7.00 "Air Pollution Control" regulations adopted by MassDEP pursuant to the authority granted by Massachusetts General Laws, Chapter 111, Section 142 A-O, Chapter 21C, Section 4 and 6, and Chapter 21E, Section 6. MassDEP's review of your Application has been limited to air pollution control regulation compliance and does not relieve you of the obligation to comply with any other regulatory requirements.

MassDEP has determined that the Application is administratively and technically complete and that the Application is in conformance with the Air Pollution Control regulations and current air pollution control engineering practice, and hereby grants this **Plan Approval** for said Application, as submitted, subject to the conditions listed below.

Please review the entire Plan Approval, as it stipulates the conditions with which the Facility owner/operator ("Permittee") must comply in order for the Facility to be operated in compliance with this Plan Approval.

1. DESCRIPTION OF FACILITY AND APPLICATION

A. HISTORY AND DESCRIPTION OF OPERATIONS

The Permittee operates a liquefied natural gas (LNG) vaporization and natural gas (NG) liquefaction facility ("the Facility"). During high demand months (winter) the Facility operates in vaporization mode, and during low demand months the Facility liquefies NG for storage.

The Facility was constructed around 1967 and has not been significantly modified since then. To date MassDEP has not issued any Air Quality Plan Approvals for the Facility, since its construction predates the promulgation of the Air Pollution Control Regulations. The Facility is a major source for nitrogen oxides (NO_x) and volatile organic compounds (VOC). The Permittee holds an Operating Permit for the Facility, most recently issued as Renewal Operating Permit Transmittal No. X236053 on August 17, 2012.

The Facility is the largest natural gas supply system peak-shaving plant facility in New England, with a gas storage capacity of 3 billion cubic feet (36.5 million gallons). The Facility provides a backup supply of independent natural gas for Eversource's customers, as well as helps to maintain seasonal natural gas price stability to consumers. In the recent past, the Facility has needed to operate more often due to pipeline constraints limiting natural gas into the region. Eversource's natural gas distribution system serves 300,000 customers in 36 towns across Massachusetts.

Peak-shaving LNG facilities, including Hopkinton LNG, typically operate 20 to 30 days a year, or in some years not at all. The typical concept of "peak-shaving" is that natural gas (NG) is maintained in a liquefied state during the spring, summer and fall seasons, and is stored for peak-demand use only during the winter months. When the facility is vaporizing at its full capacity, the gas in storage will be vaporized and injected into the pipeline in approximately 12 days.

The facility helps provide system resiliency and control of the price of natural gas for consumers in MA during periods of high demand, typically during very cold winter periods. During these times, LNG that is stored on-site is vaporized back to natural gas and used to supplement supply in the Eversource distribution system. When LNG is vaporized, its expansion from liquid to vapor is very endothermic and requires addition of heat to meet pipeline temperature requirements. This heat addition is provided by four LNG vaporizers which are the subject of this Plan Approval application.

The Facility operates four SUB-X 48-65 LNG vaporizers, each equipped with four Thermal Research Model 50 gas burners (Model#: 1204G), which are used to vaporize liquefied natural gas to supplement system volume requirements. The design of LNG vaporizers (which are actually a form of process heater) is unique to this function, duty and purpose. The four (4)

vaporizer are multi-burner models, each with four burners, and with a rated nominal capacity of 46.5 MMBtu/hr per vaporizer.

B. PROJECT DESCRIPTION

Hopkinton LNG proposes to refurbish its four vaporizers, including "in-kind" replacement of the natural-gas fired burners, four per vaporizer unit. The vaporizers are direct-fired process heaters which are permitted to emit small amounts of regulated air pollutants. MassDEP has determined that replacement of the existing burners and "top works" vaporizer refurbishment triggers MassDEP Plan Approval requirements. Hopkinton LNG proposes to replace the existing 1967 vintage burners with substantially identical "in kind" replacements of the same capacity and function. Each refurbished vaporizer unit is proposed to also be updated with a replacement Linde12049G High Velocity Gas Burner. These gas burners are a standard of the industry, and have been used in major manufacturer's (LENA / Selas Fluid / T-Thermal) LNG Vaporizer systems for peak-shaving applications in the United States over the past 40 years.

The 12049G replacement burners proposed for this project are of high velocity nozzle mix design with a refractory-lined combustion chamber and are specifically designed for submerged liquid operation. This is an important distinction because they are not interchangeable with standard low nitrogen oxides style burners that are available for steam boiler applications (due to the increased back pressure of submerged direct firing in an LNG vaporizer). NO_x emissions for the Linde North America 12049G replacement burners are guaranteed at 100 ppmvd, corrected to 3 volume percent oxygen (3% O_2).

In addition to NO_x, the vaporizer exhaust contains carbon monoxide (CO), VOC, particulate matter (PM), and VOC. Limits are set for these air contaminants in Table 2 below. Potential emissions of hazardous air pollutants (HAP) are estimated at less than 0.2 tons per year, an insignificant amount, and therefore HAP is not listed in Table 2. This project will not increase emissions from the Facility, since the vaporizer burners are an "in-kind" replacement, and no changes are being made which would increase the throughput capacity of the Facility.

C. APPLICABLE REGULATORY REQUIREMENTS

1. State Requirements

This project is subject to 310 CMR 7.02(8) requirement for Best Available Control Technology (BACT). The Application documented that the combustion controllers for the new burners will include electronic tuning versus the mechanical tuning linkages in the existing burner controllers. The replacement electronic controls will enable adjustment from the control screen to achieve optimum combustion throughout the entire firing range of the burner. As a result, actual annual emissions from the Hopkinton LNG vaporizers are expected to be better controlled and lower over the entire load range than the burners they will replace, resulting in an expected annual reduction in NO_x and CO from vaporization of LNG.

The Application contained a top down BACT analysis for add-on emission controls. In particular, the addition of water injection to the burners for NO_x control was investigated. Water injection was found to be probably infeasible from the technical standpoint, and economically infeasible as well. Selective catalytic reduction for NO_x control and oxidation catalyst for CO and VOC were both rejected as technically infeasible. (The low exhaust gas temperature from the vaporizers, around 100 °F, precludes the use of catalyst technologies.)

In the Application, the Permittee proposed to substantially limit the maximum allowable natural gas supply to the four vaporizers at 161.5 MMSCF/yr on a rolling twelve-month basis, which is a considerable restriction on potential to emit compared with present allowable emissions. (Previously, under the Operating Permit, there were no emission limits on the vaporizers.) The purpose of this restriction is to make the project not subject to review under either 310 CMR 7.00: Appendix A or Federal Prevention of Significant Deterioration (PSD). The fuel burning limit and corresponding emission restriction also serve to limit the vaporizers potential to emit for BACT purposes

MassDEP has determined that BACT for this project is the combination of a restriction on fuel burning, and the installation of upgraded electronic combustion controls on the vaporizers, with lower expected emissions of NO_x and CO.

MassDEP previously determined that the vaporizers were subject to 310 CMR 7.19- Reasonably Available Control Technology for NO_x. MassDEP has reviewed this matter again, and has now determined that the vaporizers are not subject to 310 CMR 7.19, because they are not steam boilers.

This project is not subject to 310 CMR 7.00: Appendix A Nonattainment Review, because emissions are not increasing.

2. Federal Requirements

The Permittee has indicated that the Project is not subject to 40 CFR Part 60, 40 CFR Part 61, 40 CFR Part 63, or 40 CFR Part 64. The vaporizers are not subject to 40 CFR Part 60 Subpart Dc or 40 CFR Part 63 Subpart JJJJJJ because they are not steam generators. The vaporizers are not subject to 40 CFR Part 64 because there is no add-on control technology requiring compliance assurance monitoring.

The Facility and the vaporizers are subject to 40 CFR Part 98, Subpart C, Greenhouse Gas Reporting for General Stationary Combustion Sources, because the Facility's total stationary fuel combustion sources have the potential to emit greater than 25,000 metric tons per year of carbon dioxide equivalents (CO2e).

The Permittee has demonstrated that the emissions of SO_2, NO_2, CO, PM, and PM_{10} are not expected to rise above PSD significance levels; therefore, PSD review will not be required for these pollutants.

2. EMISSION UNIT IDENTIFICATION

Each Emission Unit ("EU") identified in Table 1 is subject to and regulated by this Plan Approval:

Table 1

EU	Description	Design Capacity	Pollution Control Device (PCD)
EU6	Linde Engineering North America Vaporizer A	46.5 MMBtu/hr	None
EU7	Linde Engineering North America Vaporizer B	46.5 MMBtu/hr	None
EU8	Linde Engineering North America Vaporizer C	46.5 MMBtu/hr	None
EU9	Linde Engineering North America Vaporizer D	46.5 MMBtu/hr	None

Table 1 Key:

EU = Emission Unit Number
PCD = Pollution Control Device
MMBtu/hr = Million British Thermal Units per hour

3. APPLICABLE REQUIREMENTS

A. OPERATIONAL, PRODUCTION and EMISSION LIMITS

The Permittee is subject to, and shall not exceed the Operational, Production, and Emission Limits as contained in Table 2:

Table 2						
EU	**Operational / Production Limit**	**Air Contaminant**	**Emission Limits (Notes 1, 2 & 3)**			
			lb/MMBtu	**lb/hour**	**TPM**	**TPY**
6-9	1. Combined total fuel usage not to exceed 161.5 million cubic feet natural gas per year. 2. Natural Gas shall be the only fuel.	NO_x	0.12	22.6	8.1	10
		CO	0.44	82.5	29.7	36.5
		VOC	0.03	5.6	2.0	2.5
		SO_2	0.0022	0.4	0.14	0.18
		$PM/PM_{10}/PM_{2.5}$	0.01	1.9	0.67	0.82

Table 2 Key:

EU = Emission Unit Number
CO = Carbon Monoxide
$PM/PM_{10}/PM_{2.5}$ = Total Particulate Matter of all size, both filterable and condensable
TPY = tons per consecutive12-month period
VOC = Volatile Organic Compounds
lb/MMBtu = pounds per million British Thermal Units
NO_x = Nitrogen Oxides
SO_2 = Sulfur Dioxide
HAP (total) = total Hazardous Air Pollutants.
TPM = tons per month
lb/hour = pounds per hour

Table 2 Notes
Note 1: Compliance with the lb/MMBtu and lb/hour emission limits shall be based on the results of an applicable USEPA Reference Test Method. The lb/MMBtu and lb/hour emission limits do not apply during startup and shutdown.
Note 2: Compliance with the TPM and TPY emission limits shall be determined by computing actual emissions on a monthly basis. The actual emissions shall be computed by multiplying actual fuel usage in MMBtu times the lb/MMBtu limits listed in the table.
Note 3: For the purposes of calculating emissions from the fuel burned, the following heat content value shall be used: Natural gas: 1,020 Btu per cubic foot.

B. COMPLIANCE DEMONSTRATION

The Permittee is subject to, and shall comply with, the monitoring, testing, record keeping, and reporting requirements as contained in Tables 3, 4, and 5:

Table 3	
EU	**Monitoring and Testing Requirements**
6-9	1. The Permittee shall conduct stack performance compliance testing, within 180 days of first fire of the vaporizers, to demonstrate compliance with the NO_x, CO, VOC, and PM (filterable and condensable) emission limitations in pounds per million Btu and pounds per hour as listed in Table 2 above. All compliance testing shall be conducted in accordance with the test methods and procedures set forth in 40 CFR Part 60, Appendix A or the latest test methods recommended by USEPA. For the purpose of this compliance testing, one out of the four units shall be selected to be tested.
	2. Following completion of the initial compliance test for each vaporizer, the Permittee shall test the other vaporizers one at a time on a rotating schedule. Each subsequent test shall be done within five years of the previous test, and shall test for NO_x and CO.
	3. The Permittee shall install fuel flow meters to monitor total usage of natural gas in order to calculate emissions as required by Table 2.
	4. The Permittee shall, in accordance with 310 CMR 7.04(4)(a), inspect and maintain the fuel utilization facility in accordance with manufacturer's recommendations and test for efficient operation at least once each calendar year.
	5. The Permittee shall quantify and include all periods of emissions from EU6 through EU9, even if attributable to an emergency/malfunction or start up/shutdown, in the determination of rolling 12-month period emissions and compliance with the rolling 12-month period emission limitations as stated in Table 2.
	6. The Permittee shall monitor all operations to ensure sufficient information is available to comply with 310 CMR 7.12 Source Registration.
	7. If and when MassDEP requires it, the Permittee shall conduct additional emission testing in accordance with USEPA Reference Test Methods and Regulation 310 CMR 7.13.
	8. At least 30 days prior to emission testing, the Permittee shall submit to MassDEP for approval a stack emission pretest protocol. The protocol shall include a description of procedures for NO_x, CO and VOC optimization/ minimization, as well as a description of the test methods to be employed and the Facility operating conditions during the test.
	9. Within 45 days after emission testing, the Permittee shall submit to MassDEP a final stack emission test results report.

Table 3 Key:

EU = Emission Unit Number
CO = Carbon Monoxide
Btu = British thermal unit
NO_x = Nitrogen Oxides
VOC = Volatile Organic Compounds

Table 4	
EU	**Record Keeping Requirements**
6-9	1. The Permittee shall maintain adequate records on-site to demonstrate compliance status with all operational, production, and emission limits contained in Table 2 above. Records shall also include the actual emissions of air contaminant(s) emitted for each calendar month and for each consecutive twelve-month period (current month plus prior eleven months). These records shall be compiled no later than the 15th day following each month. An electronic version of the MassDEP approved record keeping form, in Microsoft Excel format, can be downloaded at http://www.mass.gov/eea/agencies/massdep/air/approvals/limited-emissions-record-keeping-and-reporting.html#WorkbookforReportingOn-SiteRecordKeeping.
	2. The Permittee shall maintain records of monitoring and testing as required by Table 3.
	3. The Permittee shall maintain a copy of this Plan Approval, underlying Application and the most up-to-date SOMP for the EU(s) approved herein on-site.
	4. The Permittee shall keep records of the hours of operation, including start-ups and shutdowns.
	5. The Permittee shall maintain a record of routine maintenance activities performed on the approved EU(s) and monitoring equipment. The records shall include, at a minimum, the type or a description of the maintenance performed and the date and time the work was completed.
	6. The Permittee shall maintain a record of all malfunctions affecting air contaminant emission rates on the approved EU(s) and monitoring equipment. At a minimum, the records shall include: date and time the malfunction occurred; description of the malfunction; corrective actions taken; the date and time corrective actions were initiated and completed; and the date and time emission rates and monitoring equipment returned to compliant operation.
	7. The Permittee shall maintain records to ensure sufficient information is available to comply with 310 CMR 7.12 Source Registration.
	8. The Permittee shall maintain records required by this Plan Approval on-site for a minimum of five (5) years.
	9. The Permittee shall make records required by this Plan Approval available to MassDEP and USEPA personnel upon request.

Table 4 Key:

EU = Emission Unit Number
SOMP = Standard Operating and Maintenance Procedure
PCD = Pollution Control Device
USEPA = United States Environmental Protection Agency

Table 5	
EU	**Reporting Requirements**
6-9	1. The Permittee shall submit to MassDEP all information required by this Plan Approval over the signature of a "Responsible Official" as defined in 310 CMR 7.00 and shall include the Certification statement as provided in 310 CMR 7.01(2)(c).
	2. The Permittee shall notify this Office in writing, BAW Permit Chief, when the installation of the replacement units are complete and it is deemed ready for operation, within 14 days thereof.
	3. The preliminary Standard Operating and Maintenance Procedures (SOMP) shall be submitted to this Office, BAW Permit Chief within 30 days of completion of construction of the subject equipment.
	4. The Permittee shall submit the Final SOMP concerning EU6, EU7, EU8, EU9 to this Office, BAW Permit Chief, within 60 days of completion of the required initial compliance testing of EU6, EU7, EU8, EU9. The Final SOMP must include standard operating and maintenance procedures for the subject equipment.
	5. The Permittee shall submit any subsequent revision(s) made to the Final SOMP concerning EU6, EU7, EU8, EU9, to this Office, BAW Permit Chief**,** within 15 days of said revision(s).
	6. The Permittee shall notify the Central Regional Office of MassDEP, BAW Permit Chief by telephone: 508-767-2845, email: CERO.Air@massmail.state.ma.us, or fax : 508-792-7621, as soon as possible, but no later than three (3) business day after discovery of an exceedance(s) of Table 2 requirements. A written report shall be submitted Permit Chief at MassDEP within ten (10) business days thereafter and shall include: identification of exceedance(s), duration of exceedance(s), reason for the exceedance(s), corrective actions taken, and action plan to prevent future exceedance(s).
	7. The Permittee shall report annually to MassDEP, in accordance with 310 CMR 7.12, all information as required by the Source Registration/Emission Statement Form. The Permittee shall note therein any minor changes (under 310 CMR 7.02(2)(e), 7.03, 7.26, etc.), which did not require Plan Approval.

Table 5 Key:

EU = Emission Unit Number

4. SPECIAL TERMS AND CONDITIONS

A. The Permittee is subject to, and shall comply with, the Special Terms and Conditions as contained in Table 6 below:

Table 6	
EU	**Special Terms and Conditions**
6-9	1. A copy of this Plan Approval letter and the Standard Operating and Maintenance Procedure for the subject equipment shall be maintained at the control room of the Facility
	2. In the event of nuisance complaints due to noise, odor, etc., the Permittee shall follow the procedure outlined in Appendix F of the Application for responding to complaints.
	3. Any net NO_x or VOC emissions increase occurring over a period of five consecutive calendar years which equates to 25 or more tons of NO_x or VOC (including the 10.0 tons of allowable NO_x emissions generated from the subject equipment) shall become subject to Nonattainment Review, as per the requirements of 310 CMR 7.00: Appendix A.

Table 6 Key:

EU = Emission Unit Number

B. The Permittee shall install and use an exhaust stack, as required in Table 7, on each of the Emission Units that is consistent with good air pollution control engineering practice and that discharges so as to not cause or contribute to a condition of air pollution. Each exhaust stack shall be configured to discharge the gases vertically and shall not be equipped with any part or device that restricts the vertical exhaust flow of the emitted gases, including, but not limited to, rain protection devices known as “shanty caps” and “egg beaters.”

C. The Permittee shall install and utilize exhaust stacks with the following parameters, as contained in Table 7, for the Emission Units that are regulated by this Plan Approval:

Table 7				
EU	**Stack Height Above Ground (feet)**	**Stack Inside Exit Dimensions**	**Stack Gas Exit Velocity Range (feet per second)**	**Stack Gas Exit Temperature Range (°F)**
6-9 (two separate stacks for each unit)	25	24 inches	Approx. 43	Approx. 90

Table 7 Key:

EU = Emission Unit Number

°F = Degree Fahrenheit

5. GENERAL CONDITIONS

The Permittee is subject to, and shall comply with, the following general conditions:

A. Pursuant to 310 CMR 7.01, 7.02, 7.09 and 7.10, should any nuisance condition(s), including but not limited to smoke, dust, odor or noise, occur as the result of the operation of the Facility, then the Permittee shall immediately take appropriate steps including shutdown, if necessary, to abate said nuisance condition(s).

B. If asbestos remediation/removal will occur as a result of the approved construction, reconstruction, or alteration of this Facility, the Permittee shall ensure that all removal/remediation of asbestos shall be done in accordance with 310 CMR 7.15 in its entirety and 310 CMR 4.00.

C. If construction or demolition of an industrial, commercial or institutional building will occur as a result of the approved construction, reconstruction, or alteration of this Facility, the Permittee shall ensure that said construction or demolition shall be done in accordance with 310 CMR 7.09(2) and 310 CMR 4.00.

D. Pursuant to 310 CMR 7.01(2)(b) and 7.02(7)(b), the Permittee shall allow MassDEP and / or USEPA personnel access to the Facility, buildings, and all pertinent records for the purpose of making inspections and surveys, collecting samples, obtaining data, and reviewing records.

E. This Plan Approval does not negate the responsibility of the Permittee to comply with any other applicable Federal, State, or local laws or regulations now or in the future.

F. The Application is incorporated into this Plan Approval by reference. Should there be any differences between the Application and this Plan Approval, the Plan Approval shall govern.

G. Pursuant to 310 CMR 7.02(3)(k), MassDEP may revoke this Plan Approval if the construction work is not commenced within two years from the date of issuance of this Plan Approval, or if the construction work is suspended for one year or more.

H. This Plan Approval may be suspended, modified, or revoked by MassDEP if MassDEP determines that any condition or part of this Plan Approval is being violated.

I. This Plan Approval may be modified or amended when in the opinion of MassDEP such is necessary or appropriate to clarify the Plan Approval conditions or after consideration of a written request by the Permittee to amend the Plan Approval conditions.

J. Pursuant to 310 CMR 7.01(3) and 7.02(3)(f), the Permittee shall comply with all conditions contained in this Plan Approval. Should there be any differences between provisions contained in the General Conditions and provisions contained elsewhere in the Plan Approval, the latter shall govern.

6. MASSACHUSETTS ENVIRONMENTAL POLICY ACT

MassDEP has determined that the filing of an Environmental Notification Form (ENF) with the Secretary of Energy & Environmental Affairs, for air quality control purposes, was not required prior to this action by MassDEP. Notwithstanding this determination, the Massachusetts Environmental Policy Act (MEPA) and 301 CMR 11.00, Section 11.04, provide certain "Fail-Safe Provisions," which allow the Secretary to require the filing of an ENF and/or an Environmental Impact Report (EIR) at a later time.

7. APPEAL PROCESS

This Plan Approval is an action of MassDEP. If you are aggrieved by this action, you may request an adjudicatory hearing. A request for a hearing must be made in writing and postmarked within twenty-one (21) days of the date of issuance of this Plan Approval.

Under 310 CMR 1.01(6)(b), the request must state clearly and concisely the facts, which are the grounds for the request, and the relief sought. Additionally, the request must state why the Plan Approval is not consistent with applicable laws and regulations.

The hearing request along with a valid check payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100.00) and a completed Adjudicatory Hearing Fee Transmittal Form, a copy of which is attached hereto, must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

This request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver as described below. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority.

MassDEP may waive the adjudicatory hearing filing fee for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file, together with the hearing request as provided above, an affidavit setting forth the facts believed to support the claim of undue financial hardship.

Enclosed is a stamped approved copy of the application submittal.

Should you have any questions concerning this Plan Approval, please contact Paul Dwiggins by telephone at 508-767-2760, or in writing at the letterhead address.

This final document copy is being provided to you electronically by the Department of Environmental Protection. A signed copy of this document is on file at the DEP office listed on the letterhead.

Roseanna E. Stanley
Permit Chief
Bureau of Air and Waste

Enclosures:

- Adjudicatory Hearing Fee Transmittal Form
- Stamped Plan Application

ecc: Hopkinton Board of Health bryanb@hopkintonma.gov
HopkintonFire Department sslaman@hopkintonfd.org
MassDEP/Boston - Yi Tian
Tree Raine, ERM
Thomas O'Rourke, Eversource